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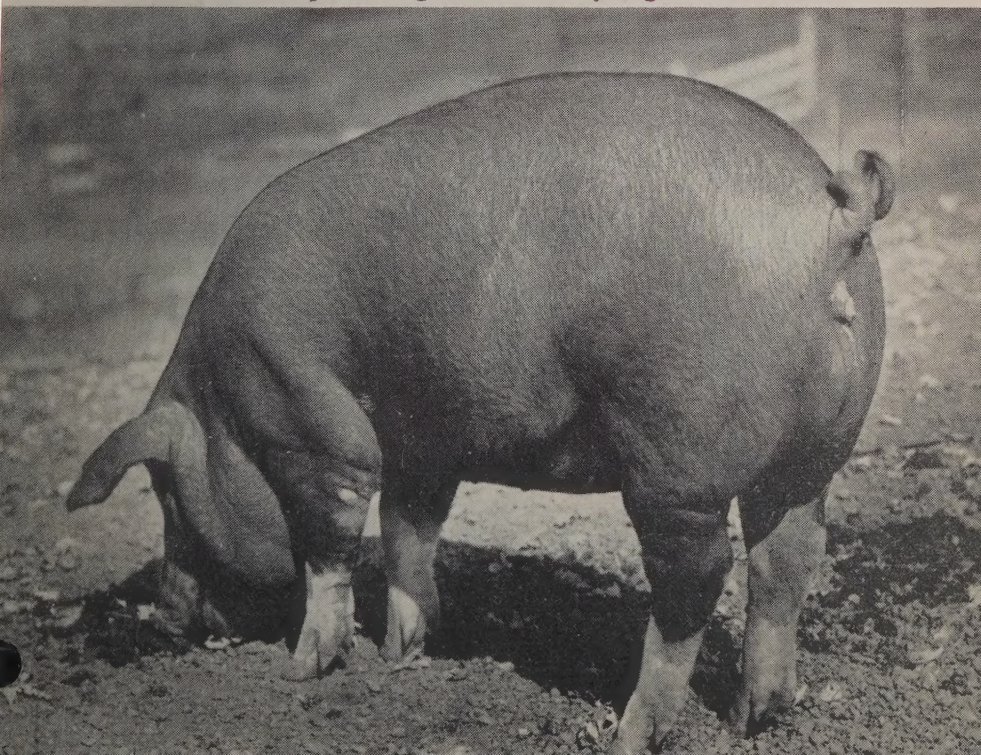
Swine Diseases
Prevention and Control

GLENN C. HOLM AND W. M. BEESON

Proper management=healthy hogs



Hog cholera can be prevented. (Page 6)

Acute or chronic swine erysipelas is usually introduced into a clean herd by carriers. (Pages 7 and 8)

Infectious enteritis is more prevalent in hogs that are improperly fed in dirty hog lots. (Page 8)

Tuberculosis of swine is best controlled by eliminating tuberculosis from the poultry. (Page 8)

Swine brucellosis is introduced by carriers. (Page 9)

Roundworms are best controlled by the McLean system of sanitation. (Page 10)

There is no effective treatment for lungworms. (Page 12)

Hog lice and mange can be controlled. (Page 13)

Vitamin A is essential in hog rations. (Page 14)

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Swine Diseases, Prevention and Control

GLENN C. HOLM AND W. M. BEESON*

SWINE production is one of the established livestock enterprises of Idaho. Long continued production, or the rapid increase of livestock in a locality, usually is accompanied by more or less trouble with diseases. The farmer in Idaho is aware that he can make a profitable enterprise of swine production providing hog diseases do not interfere with his operations. He is, therefore, interested in knowing what the most common and most destructive swine diseases are, how they are introduced onto his farm, how he can prevent their entrance, how he can eliminate or hold in check diseases already present on the farm, and what he can do in the way of treatment for disease conditions present in his hogs.

Prevalence of Swine Diseases in Idaho

At the present time most of the swine diseases are present in Idaho. Certain of the infections are not common in some areas, but their presence in the state is a potential danger to the swine industry.

The acute infectious diseases that have been found in the state are: hog cholera, hog flu, acute swine erysipelas, infectious enteritis, and hog septicemia. The chronic infectious diseases present are: tuberculosis (usually of fowl origin), chronic swine erysipelas, and swine brucellosis (abortion).

Filth-borne diseases such as bull nose, navel infection, intestinal worms, lungworms, and coccidiosis also are found in Idaho. Lice and mange, two external parasite diseases, are quite common.

Nutritional diseases such as rickets, vitamin A deficiency, goitre (hairlessness), and anemia also occur.

Preventing the Introduction of Swine Diseases

Infectious and parasitic diseases do not develop spontaneously. They must be introduced into the herd or to the premises from some source. There are many ways that the disease organisms may be brought on the premises. Among the modes of entrance are: carrier pigs; recently exposed animals; infection carried by other livestock, farmers, hog buyers, or neighbors. Diseases also may be introduced through the use of contaminated trailers; by contaminated irrigation water, which is rather common in southern Idaho; by feeding contaminated garbage; and by swine recently immunized with the simultaneous treatment for hog cholera.

Since any of the above can introduce infection into the swine herd, it is highly important that animals be secured from healthy herds; and it is advisable to know definitely that they are not carriers of such chronic diseases as tuberculosis, chronic swine erysipelas, and swine brucellosis. Tuberculous swine can be detected through the tuberculin test, and blood tests will detect chronic erysipelas and brucellosis.

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Swine that have been immunized with the simultaneous method for the control of hog cholera should not be introduced on clean premises for at least 21 days after immunization. These pigs also should be dipped in a weak creosote solution to destroy all organisms that may be on the feet and skin.

It often is dangerous to buy hogs that have gone through a public sale yard, because they may have come in contact with infected pigs, infected premises, or may have come from an infected herd. For this reason it is highly important to buy pigs of a known origin which are in a good state of health.

A fairly safe method of introducing new blood into the swine herd is by the addition of boar pigs or bred gilts. These animals should, of course, receive tests for erysipelas, brucellosis, and the tuberculin test for tuberculosis. As an added precaution the newly acquired pigs should be held in quarantine for at least 30 days.

Swine Sanitation

The one outstanding weapon that can be economically and safely used in combating swine diseases is cleanliness in raising the pig crop. Usually the hog raiser does not experience disease losses for the first few years, especially if the land used has not been employed in swine production in recent years. As the swine population increases, and as the ground becomes more and more contaminated with parasite eggs and infectious bacteria, hog losses begin to increase. Losses are first manifested by an increasing number of runty pigs. This usually is a result of parasitism by intestinal roundworms, lungworms, or some of the filth-borne infections such as bull nose or necrotic enteritis.

The United States Bureau of Animal Industry, during an investigation of hog losses, determined that the majority of trouble was due to the absence of a system of swine sanitation. In 1919, Dr. B. H. Ransom *(1)* of the United States Bureau of Animal Industry, together with the Farm Bureau, and swine producers in McLean County, Illinois, inaugurated a system of sanitation. Their aim was to protect young pigs against infestation of roundworms for the first 3 or 4 months of their life. Since that time the McLean system of swine sanitation has become popular throughout the Middle West, and in many sections in the Western States.

It was found that in addition to controlling intestinal roundworm parasites, many of the other filth-borne diseases also were controlled. It also was found that intestinal parasites did little damage to pigs if they were not infected until they were 3 or 4 months of age. The McLean system of swine sanitation emphasizes the following steps:

First, clean the farrowing pens thoroughly. Remove all litter and equipment, and wash the house with boiling lye water. All equipment should be treated in a similar manner. The boiling water destroys parasite eggs, while the lye, in addition to its cleaning properties, acts as a disinfectant on bacteria. Lye can be added at the rate of one can (12 to 13 ounces) for 10 gallons of boiling water.

Second, wash the sow with warm, soapy water, removing all dirt from

the body and feet before placing her in the clean disinfected farrowing pen.

Third, keep the sow and pigs confined to the farrowing pen, if it is in the vicinity of old hog lots, until they are removed to a clean pasture. Whenever the weather permits the sow and pigs should be moved to clean pastures within 2 weeks after farrowing. After the pigs are 5 days old, and while they are confined, supply clean soil daily to prevent anemia.

Fourth, haul the sow and pigs to the pasture to avoid picking up worm eggs from contaminated yards and lanes. The cart should be thoroughly cleaned before the pigs are hauled.

Fifth, prevent the pigs from coming in contact with contaminated ground by using hog-tight fences between pastures.

Sixth, do not run pigs on low, wet pastures, or allow them on pastures that are being irrigated at the time.

Seventh, prevent the development of heavily contaminated areas near the feeding equipment, by moving such equipment occasionally, or by using feeding platforms.

Advantages of Hog Lot Sanitation

In order that growers may be fully aware of the importance of sanitation in swine production, the following data from the University of Illinois *(2)* are presented:

This information is based on records of 13,478 pigs raised from 1,977 sows on 154 farms in Illinois, by the use of the sanitary system, and compared with a large number of pigs raised in permanent hog lots on the same farms. Ninety-eight and two-tenths per cent of the pigs saved at farrowing time were raised by the use of the *sanitary method.*

Large litters raised. An average of 1.6 to 2.7 more pigs per litter were raised. Farms formerly having the greatest trouble increased the size of litters most.

Number of sows needed reduced. Twenty-eight per cent fewer sows were needed to produce the same number of pigs. Seven or 8 sows under proper sanitary conditions thus raised as many pigs as 10 sows with poor sanitation.

Almost no runts with sanitation. In addition to the number of pigs saved by sanitation, the number of runts was reduced from 18 out of every 100 pigs to 1 out of 100 pigs. A runty pig usually is a liability.

Faster gains by sanitary system pigs. The sanitary-system pigs weighed an average of 27 pounds more at 4 months of age than permanent hog-lot pigs. Furthermore, sanitary-system pigs reached marketable size 7 weeks earlier, and weighed 28 pounds more than the permanent hog-lot pigs at the time they were sold.

Elimination of Diseases in the Herd

Every precaution should be taken to prevent the introduction of swine diseases into the herd, but much may be done to eliminate diseases already present. Animals visibly sick should be segregated immediately from the remainder of the herd to prevent the disease spreading, because it may be contagious. Most infectious diseases as well as practically all parasitic

disturbances of swine are transmissable, that is, "catching." The early isolation and treatment of animals affected with cholera, flu, hemorrhagic septicemia, mange, scours, or "necro" will do much to prevent the disease spreading to other animals in the herd. The inauguration of a swine management program that provides for cleanliness in growing the young pigs will help to prevent the development of intestinal parasites and filth-borne diseases commonly present in Idaho swine herds.

Since these diseases are of major importance to the swine grower of Idaho, a definite program must be followed to prevent their spreading to the young stock. These diseases are preventable, but often are not amenable to treatment.

Control of Hog Diseases

There is a law in the State of Idaho which makes it compulsory for livestock owners to report the presence of any suspected infectious disease. The report should be made to the Idaho Bureau of Animal Industry, State House, Boise, or to the nearest deputy state veterinarian. Your county agent will be able to assist you in getting in touch with the proper agencies.

Diagnosis

Diagnosis, or the determination of the exact disease affecting hogs, is of primary importance in deciding upon the line of treatment to be used. It is, therefore, highly desirable that the local veterinarian be called into consultation early. Considerable information concerning the diagnosis and treatment of hog diseases may be obtained from Farmers' Bulletin Number 1244, *Diseases, Ailments, and Abnormal Conditions of Swine,* which may be obtained from your county extension agent.

Acute infectious diseases such as hog cholera, anthrax, acute swine erysipelas, and infectious enteritis require early treatment. If the treatment is delayed in the case of such diseases, many animals die that ordinarily could be saved. It is just as important that chronic swine erysipelas be diagnosed early to prevent the spread of the disease through the remainder of the herd.

Parasitisms (roundworms, lungworms, and coccidiosis), pneumonia, poisoning, rheumatism, and filth-borne diseases are controlled best by following a rearing and management program that will prevent their development.

The swine producer should never place much confidence in treatment as a means of controlling intestinal parasites. No satisfactory treatment has been developed for the control of lungworms of hogs. Furthermore, no medicine has been found to be satisfactory in the prevention and control of coccidiosis of hogs. Coccidiosis is a very common disease of young hogs in practically every hog producing locality. Hog-lot sanitation is the only practical solution for lungworms and coccidiosis.

Acute Infectious Diseases

Hog Cholera

Hog cholera is an acute infectious disease caused by a filterable virus. This virus is so small that it cannot be seen even with the aid of a micro-

scope. The disease usually appears 5 to 10 days after the organism gains entrance into the herd. There are several ways in which the disease is introduced, the most common being the introduction of infected feeder pigs, immune pigs which are contaminated externally with the virus, through contaminated garbage (pork scraps), by introducing pigs that have recently been simultaneously vaccinated, and by visitors.

After the 5 to 10 day period the animal shows a high fever, complete loss of appetite, a wabbly gait, and constipation followed by diarrhea. As previously stated, this disease requires immediate treatment if the herd is to be saved. Injection of hog cholera immune serum is the only treatment of value. All medical agents have little or no merit. All sick pigs should receive serum or serum and virus (simultaneous treatment). The animals should be protected against drafts and wet bedding. The Idaho state law relative to the use of live viruses states that these agents shall be used only by deputy state veterinarians, or by other veterinarians authorized to administer them.

The preventive control of this disease is most effective when healthy, normal hogs receive the vaccine *(3)*. Parasitized and weak pigs seldom develop adequate immunity. There are three types of preventive treatments: (1) serum alone, which confers immunity for 2 or more weeks, (2) the simultaneous treatment (serum and virus), which confers life immunity when given to healthy, normal pigs, (3) the Boynton tissue vaccine, which gives an active immunity for approximately 30 days after vaccination. When two injections are given this immunity continues for approximately a year. One injection the following year gives immunity for another year. The Boynton tissue vaccine is relatively new, and is still under experimental control.

Acute Swine Erysipelas

This disease is caused by a bacterium which usually gains entrance into the animal through the mouth. The infection can be introduced into the herd by the addition of infected pigs, carrier animals, and contaminated pork scraps. This disease can be carried by turkeys, sheep, pigeons, hogs, and man. The symptoms of this disease are almost identical to those of hog cholera. The only definite way of differentiating it from hog cholera is through post mortem studies and bacterial examination.

This disease can be partially controlled by eradicating carrier animals from the herd. Contact between susceptible animals such as turkeys, sheep, pigeons and swine can be reduced through a system of pasture rotation. All garbage containing pork scraps should be cooked.

Two methods of immunizing swine against acute erysipelas are now in use. The newer method is called the simultaneous or double treatment. This treatment requires the injection of live erysipelas organisms and erysipelas immune serum. The U. S. Department of Agriculture controls the use of this method by allowing only qualified veterinarians to administer live organisms and the immune serum. A lasting immunity is developed following the use of the double treatment. The other preventive

biologic is injection of serum alone which gives only a short period of disease resistance.

Animals that already have acute swine erysipelas should be given immune serum immediately.

Infectious Enteritis

Some cases of enteritis may be due to a deficiency of niacin; however, cases observed in Idaho usually are bacterial in nature. This disease is an acute bacterial infection affecting the intestinal tract. Occasionally the lungs are involved (pneumonia). This disease may be introduced in many of the ways previously mentioned for hog cholera and swine erysipelas. It is considered a filth-borne infection. The only difference usually observed in symptoms between this disease and hog cholera are diarrhea followed by constipation, and large purple spots on the skin just prior to death. This last symptom is not diagnostic.

There are several types of treatment for this disease. In most instances the use of serums and vaccines are not effective in advanced cases. Wheat, wheat products, corn, and corn products should not be fed to hogs that have enteritis. Chopped or rolled oats and 15 to 25 per cent chopped alfalfa soaked with sour milk makes a good feed in this disease. The drinking water should be alkalized by adding baking soda at the rate of an ounce per gallon. To treat or prevent the lung disturbance that accompanies enteritis one of the tasteless guaiacol preparations can be added to the feed. Guaiacol should be used as directed by your veterinarian. It is important that all healthy pigs be isolated from the sick ones, and that the pens be kept clean.

Hog Flu

This disease is caused by the combined actions of a virus and bacteria. It is not established definitely how the infection gains entrance into the body of the animal, but it is probably through ingestion and inhalation. This disease is characterized by difficult breathing, coughing, and a discharge from the eyes. The whole herd usually is affected, but only about 2 to 5 per cent die. In the early stages this disease is quite similar to hog cholera, swine erysipelas, or infectious enteritis. Dry quarters together with the feed and treatment as listed for "Infectious Enteritis" help in hog flu.

Chronic Infectious Diseases

Tuberculosis

The avian or fowl type of tuberculosis of hogs is a very mild form of the disease, most of the lesions being located in the glands of the head and intestines. The absence of bovine or cattle type of tuberculosis in hogs in this state is accounted for by the absence of this disease in cattle except in an occasional herd. Hogs can be prevented from contracting avian tuberculosis by eliminating all affected chickens from the farm *(4)*. There is no treatment for this disease.

Chronic Swine Erysipelas

Chronic swine erysipelas is one of the manifestations of the swine disease complex. The chronic form may follow an acute outbreak of the

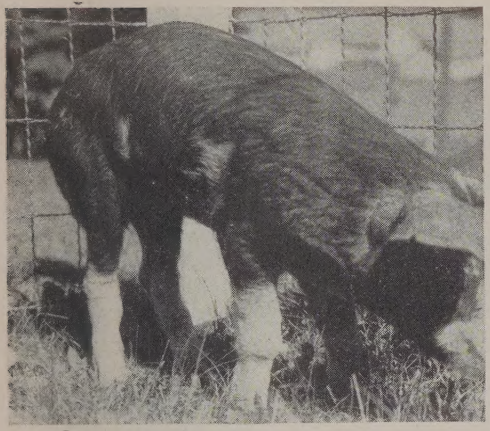

Figure 1.—Barrow showing enlargement of knee and hock. Arthritis is a common symptom of chronic swine erysipelas.

disease, or it may follow the skin form of swine erysipelas (diamond skin). Quite often, however, the chronic form develops in a herd without any history of a previous infection of this disease. One of the most common symptoms observed is the involvement of the joints (arthritis). This lameness may last only for a short time, and the animal promptly recovers, but in other instances the joints gradually become larger *(Fig. 1)*. In some of the cases of chronic swine erysipelas tissue growths occur on the heart valves. This has been called vegetative endocarditis, or cauliflower heart. Early in this disease, swine erysipelas serum usually helps to cure the lameness. Quite often animals that recover from this disease will continue as carriers of the infection. They act as a menace to the remainder of the herd through their spread of the disease. Carrier animals can be detected by blood testing. These animals should be eradicated from the herd because they are the usual source of infection for both acute and chronic swine erysipelas. For other control measures see the discussion on "Acute Swine Erysipelas" on Page 7.

Swine Brucellosis (Abortion)

This disease is a bacterial infection. The organism is quite similar to the organism producing Bangs disease of cattle, but it is not identical. The disease may be introduced through the addition of carrier sows or boars, or by any of the other modes of infection. One of the most common symptoms in the sow is early expulsion of the feti (abortion). This abortion usually occurs between 60 and 90 days pregnancy. Other symptoms which may be observed in the sow are sterility, irregularity in heat periods, and retained placenta (afterbirth). The symptoms observed in the boar are enlargement, abscess formation, or shriveling of the testicles. In some instances the boar is sterile *(Fig. 2)*.

Figure 2.—Enlargement of the testicle followed by a shrinking of the same organ is common in brucellosis of boars. (Courtesy Veterinary Medicine)

Removal of all infected animals through the use of the blood test is advisable. All additions to the herd should receive the blood test, and remain in isolation for 30 to 60 days. There is no treatment for this infection. This disease is transmissible to man, and is one of the causes of undulant fever. Great care should be exercised in handling infected swine at farrowing time. Rubber gloves, soap, water, and disinfectants help in safeguarding against the disease.

Animal Parasitic Diseases

Roundworms

Roundworms and other intestinal worms are common causes of diseases of hogs. Roundworms are easily detected in the intestines of affected pigs as round yellowish-white worms, 8 to 12 inches long. These worms are present on practically every farm where hogs have been grown for a number of years. This worm *(Ascaris suis)* lays eggs which pass out in the feces and contaminate the hog lot. Under favorable conditions these eggs embryonate or become infectious after 1 or 2 weeks. They hatch out when taken into the digestive tract of young pigs. The young worms burrow through the intestine, enter the blood stream, migrate through other organs, and eventually pass to the lungs. They stay there

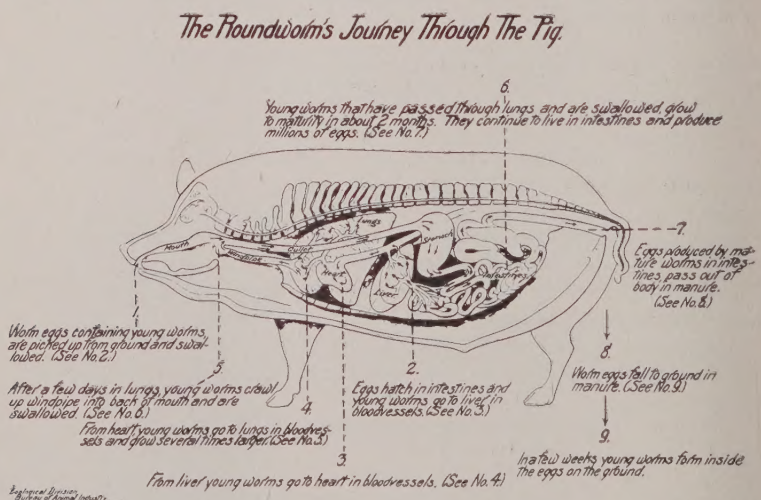
The Roundworm's Journey Through The Pig.
6.
Young worms that have passed through lungs and are swallowed, grow to maturity in about 2 months. They continue to live in intestines and produce millions of eggs. (See No. 7.)
7.
Eggs produced by mature worms in intestines, pass out of body in manure. (See No. 8.)
1.
Worm eggs containing young worms, are picked up from ground and swallowed. (See No. 2.)
5.
After a few days in lungs, young worms crawl up windpipe, into back of mouth and are swallowed. (See No. 6.)
2.
Eggs hatch in intestines and young worms go to liver in bloodvessels. (See No. 3.)
8.
Worm eggs fall to ground in manure. (See No. 9.)
4.
From heart young worms go to lungs in bloodvessels and grow several times larger. (See No. 5.)
3.
From liver young worms go to heart in bloodvessels. (See No. 4.)
9.
In a few weeks, young worms form inside the eggs on the ground.

Figure 3.—Where roundworms are found other internal parasites and filth-borne diseases also are present. Sanitary rearing is the only permanent solution of these parasite problems. (Courtesy Bureau of Animal Industry, U. S. D. A.)

for about a week or 10 days after which they migrate into the windpipe (trachea). They are coughed up into the mouth, and are swallowed by the pig. They develop into mature worms in the small intestines. About 6 or 8 weeks are required for this cycle *(Fig. 3)*. A few roundworms are not necessarily the sole cause of a pig becoming a runt, but the fact

that a pig has roundworms indicates that it has grown under conditions which favor the development of other disease conditions such as lungworms, coccidiosis, and other filth-borne diseases, all of which are detrimental and which when combined are devastating to the health of the pig.

Several treatments for roundworms have been developed. They are fairly effective in removing roundworms in 4 to 5 months old pigs if they are administered carefully (*Fig. 4*). These treatments are not effective against lungworms, coccidiosis, or intestinal infection commonly associated with roundworms, nor do they repair the damage already done to the intestinal tract, liver, and lungs of the pigs.

Three general methods are employed in administering worming agents:

1. Drenching with oil of chenopodium.
2. Administering capsules containing one of several vermifuges.
3. Feeding a palatable vermifuge in grain and milk.

Regardless of the type of treatment used the general outline below should be followed:

1. Fast animals for 18 hours.
2. Drench, capsule, or feed the animals with the type of vermifuge preferred.
3. It usually is advisable to continue the fast for approximately 4 hours longer.
4. Epsom salt can be given at this time at the rate of 1 ounce per 100 pounds body weight. This may be given in water and chopped grain, or in milk and chopped grain.
5. Allow the pigs to have full feed, but keep them closely confined for a few days in heavily bedded pens.
6. Remove litter and expelled worms each day. The litter should be burned, or hauled to land which will never be used for hog pastures.

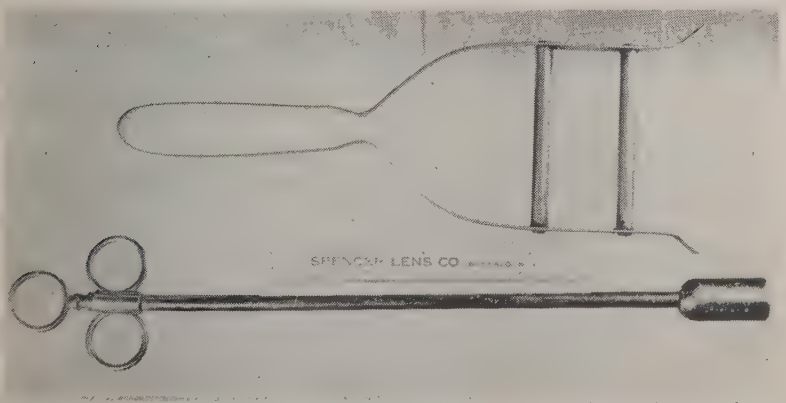

Figure 4.—When pills or capsules are to be given hogs, the mouth speculum and balling gun are great time savers.

If it is desirable to prepare oil of chenopodium vermifuge for drenching, the following formula is recommended.

> Mix 1 ounce oil of chenopodium with 1 pound of castor oil or ½ pound oil of chenopodium with 1 gallon of castor oil. Give 1 ounce (2 tablespoonsful) of the mixture to 50-pound pigs, and 2 ounces for 100-pound pigs. For larger animals use more castor oil up to 3 or 4 ounces, but do not increase the oil of chenopodium.

The use of tetra-chlorethylene in the treatment of hogs for worms is somewhat less effective than the above, but it is used quite generally. This drug is sold under trade names in 2 and 5 cubic centimeter capsules with directions. It should be given after 18 hours fasting and should be followed in 4 hours by a laxative.

Specific directions for the administration of vermifuges sold under trade names will be found on the label. These directions should be followed very closely. It is highly important that none of the vermifuges be forced into the lungs of the animal.

The feeding of slaked coal, copperas, lye, blue vitriol, or sulphur is not recommended as a means of controlling or preventing roundworms in pigs. None of these substances have proved of value in this condition.

The complete prevention of worm infestation by the use of the hog-lot sanitation, already suggested, is the only economical way to combat roundworms.

Lungworms

As their name indicates, these worms affect only lung tissue. They are ½ to 2 inches in length. They occasionally are seen in the windpipe, but usually are seen in the smaller air passages near the borders of the lungs. Eggs from these parasites are passed in the feces of the swine where they are picked up by earthworms where further development takes place. Swine pick up the parasites by eating these infected earthworms. Animals of all ages are susceptible to this parasite, but the greatest damage occurs in young pigs. There is no treatment for this condition, but the McLean system of swine sanitation is effective in preventing its occurrence.

Coccidiosis

Coccidiosis is a parasitic disease affecting the intestinal tract. The parasite that produces coccidiosis is microscopic in size. Tissue damage results from invasion of the intestinal wall by this microscopic parasite. Coccidiosis may be associated with roundworms, intestinal infections, and dysentery of young pigs. Affected pigs have poor appetites and do not grow normally. Young pigs often die with an acute blood diarrhea. Less severely affected pigs become runts or may die from some complicating infection.

Coccidiosis is diagnosed by microscopic examinations. Many treatments have been tried for this infection, but most of them have not been satisfactory. Usually a mild laxative feed is beneficial. The droppings from

affected pigs should be burned. If the entire herd is infected, it is advisable to move them at weekly intervals. It is important to remember that the organisms or eggs responsible for intestinal parasites and filth-borne diseases are all discharged with the feces and contaminate anything with which the feces come in contact.

Hog Lice

Hog lice are found back of the ears, on parts of the body that are protected, and where the skin is thin and tender. Crude oil, Diesel oil, fuel oil, and crankcase oil are effective in controlling hog lice and mange. Crankcase oil may be dangerous if it has been diluted with gasoline.

The common ways of treating hogs for lice are: hand application, hog oilers, sprayers, medicated wallows, and dipping vats. The two latter methods are the most efficient.

A concrete wallow should be placed so that it is shady during the day. Clean water should be used for a few days to permit the animals to become accustomed to the wallow. The wallow then should be drained and fresh water added to a depth of 2 to 4 inches depending upon the size of the pigs. Enough oil should be added to the wallow to make a layer 1 to 2 inches deep. A pig will remove about 1 pint of oil, and a hog 1 quart. If necessary, additional oil can be added so that all pigs become thoroughly coated with the oily preparation. After 24 to 48 hours the wallow should be drained, flushed, and refilled with fresh water. A skin irritation develops if hogs are treated too frequently. The treatments should be at least 1 week apart.

Dipping vats should be filled with water to within 2 inches of the dip line; then oil should be added to bring the solution up to the dip line. It should be remembered that each pig removes 1 to 1½ pints of oil, and each mature hog removes 1 quart. This volume should be maintained by adding more oil. The animals should enter one at a time to prevent piling up in the vat. The head of each animal should be submerged at least once, since it is important for the dip to enter the ears. A barrel may be used instead of a vat for dipping small pigs. All treated pigs should be kept in a shaded draining pen until the surplus dip has drained from them. These animals should be protected from sunlight, and exercise should be held to a minimum.

During certain times of the year it is difficult to dip animals; therefore, a spray can be used. It should be remembered that animals sprayed with a medicated spray are not as efficiently treated as those which are dipped. Two oily spray preparations are listed below:

1. Add 1 part of Diesel oil to 2 parts of light mineral oil. Spray the animal thoroughly with this preparation.
2. Add 1 pint of creosote to 1 gallon of mineral oil. Add water to thin enough for the spray.

Never treat pregnant sows or gilts with the oily preparations. Abortions may result. Other methods of treatment may be found in Farmers' Bulletin Number 185, *Hog Lice and Mange, Methods of Control and Eradication,* U. S. Department of Agriculture, Washington, D. C.

Mange

There are two types of parasites which may produce mange in swine. The one which most commonly affects swine in the United States is a member of the *Sarcoptes* group. These parasites are very small, measuring between a 1/50 and a 1/60 of an inch. They are visible to the naked eye when placed against a dark background. A hand lens will help in detecting these parasites. The parasites burrow under the outer layer of the skin producing an inflammation. The area becomes sensitive causing the animal to scratch and rub the affected spot. The skin usually is broken and oozing begins, the hair is rubbed off, and a scurf forms on the skin. A definite diagnosis of this condition is the presence of the mange mite.

The most satisfactory method of treating this condition is the use of one of the oily preparations mentioned above, and the animals can be hand treated if a dipping vat is not available. The treatments for lice, listed above, are effective in the control of mange, and the bulletin recommended above has several other methods which might be used in the treatment of this disease.

Nutritional Diseases

Vitamin Deficiencies

Vitamin A frequently is lacking in swine rations because all grains and grain by-products, excepting yellow corn, are deficient in this vitamin. Vitamin A is necessary for the proper growth and reproduction of all ages of hogs and therefore should be supplied in the ration.

Symptoms of vitamin A deficiency are characterized by slow rate of gain, high feed requirement, and usually are followed by unthriftiness and secondary infection of the respiratory system. When there is only slight vitamin A deficiency, poor gains may result without pathological symptoms. An acute case of vitamin A deficiency results in stiff joints, posterior paralysis, rough hair, loss of appetite, and respiratory complications. In acute cases, secondary lung infections usually result in pneumonia and death. Boars and sows fed on rations low in vitamin A usually will become sterile. Pregnant sows receiving a low vitamin A intake often produce pigs that are born blind or without eyeballs and are usually so weak that death results.

The plant source of vitamin A is a yellow pigment which is known as carotene. This pigment usually is abundant in yellow pigmented grain such as yellow corn and also is closely associated with feeds that are green in color. The intensity of green coloring in alfalfa hay or pasture is a good indicator of the abundance of carotene. In Idaho the most economical and abundant source of vitamin A is good leafy green alfalfa hay or pasture. If hogs are in dry lot, it is necessary to supply alfalfa hay either in a rack or by adding ground alfalfa hay to the ration. Alfalfa hay should be ground sufficiently fine to make a smooth blend with the grain mixture. For fattening hogs add from 5 to 15 per cent of alfalfa to the grain mixture and for brood sows and growing breeding stock 15 to 30 per cent of ground alfalfa may be included in the ration. *It is good swine practice to include ground alfalfa in all hog rations because it not only adds vitamin A but is*

an additional source of high quality protein, certain minerals, and other vitamins which tend to keep the hogs in a thrifty condition. Recently it has been shown that brood sows fed on rations containing 15 per cent or more alfalfa hay produce healthier pigs than sows receiving only 5 per cent of alfalfa.

Where hogs are fed on a limited amount of grain, it is satisfactory to feed alfalfa hay in a rack. *However, hogs that are being full fed on grain usually will not eat a sufficient amount of alfalfa hay to satisfy their nutritional needs.* It is the best and most economical swine practice to mix ground hay with the grain mixture.

Hogs on green pasture receive ample vitamin A from this source.

Vitamin D is the antirachitic vitamin which is necessary for the deposition of calcium and phosphorus in the bones of growing animals. It also is essential for proper metabolism of calcium and phosphorus in mature animals. Many times vitamin D is called the "sunshine" vitamin because the ultra violet rays of the sun will prevent rickets.

A rachitic condition may be caused by lack of vitamin D, calcium, phosphorus, or a combination of these factors. Pigs suffering from rickets become stiff, buck-kneed, joints enlarge, the legs are weak and crooked, and the pigs have difficulty in getting up to eat. Usually the fattest and fastest growing pigs are affected first by this deficiency because their requirement is higher than a pig growing slower. In severe cases posterior paralysis occurs which is due in certain instances to a fracture of the backbone resulting in a pressure on the spinal nerve. A rachitic condition is more likely to occur among pigs during the fall and winter months when they are confined indoors or when the weather is cloudy for several months.

Good sources of vitamin D are direct sunshine, sun-cured alfalfa hay, and fish liver oils. As long as pigs are allowed access to the direct rays of the sun there is little danger of a vitamin D deficiency excepting during cloudy months. However, in the coldest weather it is a good practice to allow the pigs to be outdoors for a few hours when the maximum amount of sunshine is available. If a severe rachitic condition develops, this may be cured by the addition of 1 per cent of natural cod liver oil to the grain mixture, or by supplying other liver oils on an equivalent vitamin D potency basis.

Vitamin B-Complex. It has been shown that growing pigs require certain members of the vitamin B-complex, namely thiamin, riboflavin, niacin (nicotinic acid), pantothenic acid, pyrodoxine, and probably some other members of the B-complex. The vitamin B-complex is not likely to be lacking in practical swine rations under Idaho conditions because wheat, alfalfa hay, pasture, and milk by-products are excellent sources of these vitamins.

The symptoms of deficiencies associated with the respective members of the vitamin B-complex vary considerably and therefore will not be taken up in this bulletin. It is sufficient to say that as long as good quality alfalfa hay or pasture is included in typical Idaho rations adequate amounts of various vitamins of the B-complex will be supplied.

Other Vitamins. There are many other vitamins known to the livestock industry such as vitamins C, E, K, etc., but at present these vitamins

are of no practical importance and apparently are adequately supplied either by the natural feeds or synthesized by the body.

Minerals

Salt. Hogs of all ages should have salt (sodium chloride) whether on pasture or in dry lot. Adequate amounts of salt may be supplied by including ¼ to ½ per cent of finely ground salt in the grain mixture, or by allowing the hogs free access to salt alone or mixed with minerals. Finely ground stock salt is preferable to mix with the grain but coarsely ground or block salt may be used where hogs are given free access. It is rather difficult for hogs to secure enough salt from a block. Salt should be provided for hogs at all times. Hogs that have been denied salt for some time and then given free access to it may eat such large quantities as to cause digestive disturbances and even death. Animals hungry for salt should be given small quantities daily until the intense craving has largely disappeared.

Calcium. Calcium deficiency is so prevalent among hogs in this state that too much attention cannot be given to balancing swine rations in regard to this mineral. *All grains, by-products of grains, and vegetable protein supplements are deficient in calcium.* Hogs do not consume enough roughage in the form of legume hay to satisfy their calcium needs. It is imperative that all hog rations be supplemented with some source of calcium.

A calcium deficiency is characterized in fattening and growing pigs by going off feed, stiffness, buckled and enlarged joints, lameness, and posterior paralysis. Usually the fattest and fastest growing pigs succumb first due to the fact that their body requires more calcium for the development of the skeletal system. In extreme cases of calcium deficiency hogs die suddenly from a low calcium tetany. Brood sows and gilts deprived of adequate calcium produce weak pigs and usually do not have sufficient milk to nourish the pigs. Poor milk production is one of the most characteristic symptoms of a calcium deficiency in brood sows. In severe cases sows will break down in the back, resulting in a posterior paralysis.

Calcium supplements usually are cheap and available in most communities. Flour-fine oyster shell, ground limestone, calcite, steamed bonemeal, marl, gypsum, air-slaked lime, calcium carbonate, or wood ashes are all good calcium supplements.

All hog rations should include a calcium supplement unless the diet is being balanced for protein with meat meal, fishmeal, skim milk, or buttermilk. However, even when animal proteins are used, it is a good practice to give the hogs free access to a calcium supplement.

Calcium supplements, such as ground oyster shell, should be added at the rate of 1 pound to 100 pounds of grain. The same results may be accomplished by allowing the hogs free access to one of the following mineral mixtures.

Mixture 1		Mixture 2	
Oyster shell	200 lb.	Oyster shell	100 lb.
Salt	100 lb.	Steamed bonemeal	100 lb.
Potassium iodide	1 oz.	Salt	100 lb.
		Potassium iodide	1 oz.

Phosphorus. A phosphorus supplement never is needed in a hog ration because all grains and by-products of grains are rich in phosphorus

and adequately supply the body requirement. In fact, adding a phosphorus supplement tends to unbalance the ratio of calcium to phosphorus and thus upset the mineral balance.

Iodine. Many areas in Idaho are deficient in iodine which makes it advisable to supply a source of iodine in brood sow and boar rations. An iodine deficiency is detected easily by the enlarged necks and hairless pigs at birth.

Iodine is a very unstable compound and readily volatilizes from salt mixtures if stored for long periods. A stable iodine salt mixture developed by the Wisconsin Experiment Station is as follows:

Sodium thiosulphate	2.0 lb.
Sodium carbonate	2.0 lb.
Cornstarch	2.0 lb.
Potassium iodide	0.4 lb.

Mix the above with 1 ton of finely ground salt. It is advisable to add a small amount of charcoal to color the iodine mixture so as to be able to detect when it is thoroughly mixed with the salt.

If a mixture is made up every 2 to 3 months, it is satisfactory to use a mixture of 1 ounce of potassium iodide to every 300 pounds of salt. Iodized salt may be used provided it has not lost the iodine value. Iodine usually can be detected in salt by the odor.

Iron and Copper. Suckling pigs confined to enclosures with concrete or wooden floors or on frozen ground so that the pigs do not have access to soil usually develop nutritional anemia in about 2 to 3 weeks after birth. Anemia is caused by a lack of sufficient iron and copper in the mother's milk, and since milk naturally is deficient in these mineral elements, the little pig must seek other sources to satisfy this nutritional requirement.

Symptoms of anemia usually appear 2 to 3 weeks after birth and are associated with pot bellies, rapid breathing, and "thumping." Affected pigs are weak, listless, and extremely short of breath.

One of the most practical and successful ways to prevent anemia is to provide plenty of clean soil or green feed for the pigs to eat. Fresh soil (free from parasite eggs) should be placed in the pens twice weekly. Clean soil contains sufficient iron and copper to supply this need. Another treatment for anemia is to swab the sow's udder daily with a saturated solution of ferrous sulfate. As soon as the pigs start eating grain, special treatments for anemia may be discontinued.

It appears that the addition of iron compounds to mineral mixtures is not necessary, and it usually interferes with the assimilation of phosphorus.

Minor Elements. Other mineral elements such as potassium, manganese, magnesium, cobalt, sulphur, zinc, etc., are distributed abundantly enough among natural feeds to satisfy the requirement of pigs of various ages. Under certain feeding conditions manganese has been shown to be lacking in hog fattening rations and resulting in lameness and enlargement of hock joints. However, as far as known, a manganese deficiency does

not exist in feeds used in Idaho. Calcium, salt, iodine, iron, and copper are the only minerals that need to be added to hog rations.

Miscellaneous Ailments

Abscesses

Abscesses may develop at any point on the body. They usually occur just under the skin, and most often are seen around the jaw or along the throat. When they are headed up, that is, become soft at one point, they should be lanced and irrigated with a mild antiseptic solution.

Hernia or Rupture

Umbilical and scrotal hernias are most common. The passage of the intestines through openings of the abdominal wall into sacs under the skin of the belly or into the scrotum produces a hernia. Pigs with such defects should not be used for breeding stock as these conditions are heritable. Umbilical hernias ordinarily do not need to be reduced. Scrotal hernias must be reduced at the time of castration to prevent the bowels from escaping when the sac is opened. This may be done by cutting through the scrotum down to the sac or tunic covering the testicle, twisting it up over the testicle until the intestines are forced back into the abdomen. The sac is then tied off as close to the body as possible. The testicle and sac are then removed below the ligature.

Pig Scours

This disease affects pigs from birth until a few weeks after weaning. It usually is brought about through some dietary disturbance which tends to lower natural resistance. Suckling pigs may scour if the sow develops a high temperature disease, mastitis, or is treated with some saline purge. Alterations in the ration of the sow have a tendency to increase or decrease milk flow and usually produce a digestive upset in the suckling pigs. Pigs farrowed from gilts often develop a diarrhea a few weeks before the weaning date. This often can be traced to a decrease in milk production or to low milk production of the sow.

The sow should be fed lightly for 1 or 2 days before farrowing, should receive nothing but water the day following and be fed lightly on oats, gradually increasing the amount for 4 days. Wheat and corn have a tendency to hold the sow's temperature up and should not be fed as the sole grain.

The forerunner of most cases of pig diarrhea is poor milk production in sows and improper feeding of suckling pigs.

Milk production in sows may be increased by feeding a balanced ration, which is adequate in bulk, protein, minerals, and vitamins. For best results add to the grains available meat meal 3 per cent, ground alfalfa 15 to 30 per cent, oyster shell 1 per cent and salt ¼ per cent. Pig scours is avoided in many cases by providing a "creep" where young pigs can have free access to a mixture of grains combined with 5 per cent alfalfa, 1 per cent oyster shell, and ¼ per cent salt. Meat meal should be fed in a separate compartment of the self-feeder. Creep feeding makes the pigs healthier and larger at weaning time and helps avoid many diseases that are initiated by nutritional deficiencies.

When suckling pigs develop a diarrhea all wheat and corn should be

removed from the ration and only oats and milk should be fed until the scours subside. Pigs that are near the weaning age may be given additional milk in their feed. It is essential to keep the quarters warm and clean. Baking soda at the rate of 1 ounce to the gallon in the drinking water helps in the treatment of pig scours.

Prolapse of the Rectum (Piles in Pigs)

Since it is a protrusion of the wall of the rectum past the natural body opening it is a prolapse. Piles in pigs are somewhat similar to hemorrhoids or piles in humans. It is brought on by any feed or condition that tends to develop constipation. It is best relieved or prevented by adding bran, alfalfa meal, or other laxative material to the ration. If the protruding bowel remains out for several days, it may be safely removed by cutting it off close to the skin with a sharp knife.

Thumps

Thumps is a symptom of some disturbance in respiration. Pigs with this condition have difficult, rapid, and spasmodic breathing. The disease most often responsible for the development of thumps is anemia (See Anemia). Pigs suffering from pneumonia may show the same symptoms. The common roundworm often is responsible for pneumonia since it passes through the lungs in its development (See Roundworms). Lungworms also may be responsible for thumps.

Scirrhous Cord

This is a condition affecting barrows. It develops some time after castration in one or both sides of the scrotum. Two factors are thought to be responsible for this tumor-like growth, (1) the entrance of soil-borne infection soon after castration, and (2) leaving the cord too long at the time the testicle is removed. Usually, these tumor-like masses are infected. They can be removed surgically, but ordinarily the cost of the operation is prohibitive when considering the value of the barrow. One precaution is to remove as much of the cord as possible and place the castrated pigs on clean pasture so that they do not have access to hog wallows.

Miscellaneous

Precautions for use of drugs in feed

When drugs are used in the feed, care should be taken to segregate the animals into comparable groups for size, age and degree of sickness, using an amount of feed that the respective groups will consume. The more vigorous and healthy hogs otherwise would obtain more feed and consequently more of the medicine, thus limiting the amount that sick animals would get.

Restraint of hogs

Pass a slip loop on the end of a rope over the upper jaw back of the tusks, tighten it up and snub to a convenient post or fence. Any hog, regardless of its size, so confined will simply pull back and can be drenched or otherwise treated or handled conveniently.

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